Determination of Trace Radioactive Nuclides in Radioactive Cesium Containing Particle and its Chemical Property Released by the FDNPP Accident

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Our group has been studying on the radioactivities in the environmental samples after the FDNPP accident on March, 2011. In this study, we focused on the chemical properties of radioactive cesium in the Cs-concentrated particles found near the FDNPP. The activities of ^{90}Sr were identified by chemical separation technique, and the formation process of the particles was discussed.

I. INTRODUCTION

On March 11, 2011, the Tohoku Pacific Ocean Earthquake and tsunami attack caused a severe accident at the Fukushima Daiichi Nuclear Power Plant (FDNPP) in Japan. As a results, a large amount of radioactive nuclides was released into the environment. Radioactive cesium (^{134}Cs and ^{137}Cs) is one of the most important radioactive nuclides in the nuclear accident. The total amounts of radioactive Cs released in the FDNPP accident are estimated to be more than 10 PBq [1]. Though over 6 years passed from the accident, the radioactive cesium still has been remains in the Fukushima prefecture and detected in the atmosphere in the Eastern area of Japan.

Investigation of chemical and/or physical properties of radioactive cesium is important to estimate environmental transfer process. Especially, initial properties just after release from the FDNPP should strongly influence in the distribution of radionuclide deposited in the environment. In the FDNPP accident, not only soluble aerosol but Cs-concentrated insoluble particles [2] were released in the environment. Such Cs-concentrated insoluble particles were produced near the nuclear reactor and have important information of the accident circumstances in the nuclear reactor.

Our research group has continuously been studying on radioactivities in air and soil samples near the FDNPP area just after the accident. In this paper, we will discuss chemical and/or physical properties of radioactive cesium.

II. EXPERIMENTAL AND RESULTS

We performed soil sample collection in Okuma town and Futaba town in Fukushima prefecture. From the soil sample, we extracted Cs-concentrated particles using imaging plates. After identification of radiocesium activities by gamma-ray measurement, we performed chemical separation of ^{90}Sr from each particle and determined its activity by Cherenkov light measurement. The obtained activity ratios of $^{90}Sr/^{137}Cs$ of the particles were order of 10^{-4}. These ratios were very close to these obtained from soil samples in Fukushima prefecture [3]. We also tried to reproduce such insoluble particles in the laboratory [4].The details will be discussed in the presentation.

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